FIG. 1

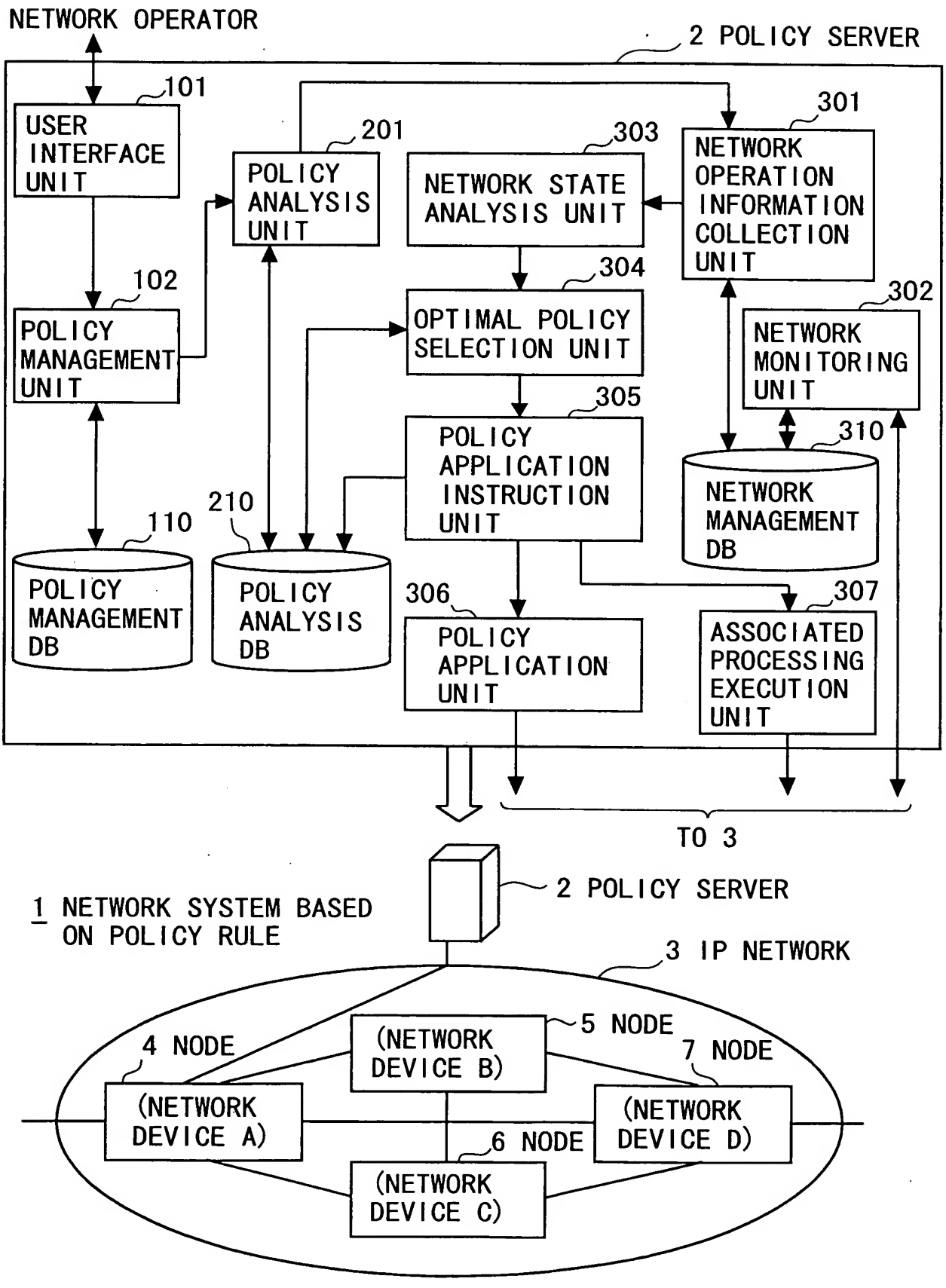
NETWORK OPERATOR
2 POLICY SERVER
101
USER INTERFACE UNIT
201
POLICY ANALYSIS UNIT
303
NETWORK STATE ANALYSIS UNIT
301
NETWORK OPERATION INFORMATION COLLECTION UNIT
102
POLICY MANAGEMENT UNIT
304
OPTIMAL POLICY SELECTION UNIT
302
NETWORK MONITORING UNIT
305
POLICY APPLICATION INSTRUCTION UNIT
310
NETWORK MANAGEMENT DB
210
110
POLICY MANAGEMENT DB
POLICY ANALYSIS DB
306
POLICY APPLICATION UNIT
307
ASSOCIATED PROCESSING EXECUTION UNIT
TO 3
2 POLICY SERVER
1 NETWORK SYSTEM BASED ON POLICY RULE
3 IP NETWORK
4 NODE
(NETWORK DEVICE A)
5 NODE
(NETWORK DEVICE B)
7 NODE
(NETWORK DEVICE D)
6 NODE
(NETWORK DEVICE C)

FIG. 2A

SINGLE POLICY RULE	CONDITION / ACTION	PATH SWITCHING	FLOW CONTROL	MAIL NOTIFICATION
POLICY RULE 1	OCCURRENCE OF LINE UNIT TROUBLE	○		
POLICY RULE 2	OCCURRENCE OF LINE UNIT TROUBLE		○	
POLICY RULE 3	OCCURRENCE OF LINE UNIT TROUBLE			○
POLICY RULE 4	EXCESS OF LINE UNIT TRAFFIC AMOUNT THRESHOLD VALUE	○		
POLICY RULE 5	EXCESS OF LINE UNIT TRAFFIC AMOUNT THRESHOLD VALUE		○	
POLICY RULE 6	EXCESS OF LINE UNIT TRAFFIC AMOUNT THRESHOLD VALUE			○
POLICY RULE 7	EEXCESS OF LINE UNIT PACKET LOSS AMOUNT THRESHOLD VALUE	○		
POLICY RULE 8	EXCESS OF LINE UNIT PACKET LOSS AMOUNT THRESHOLD VALUE		○	
POLICY RULE 9	EXCESS OF LINE UNIT PACKET LOSS AMOUNT THRESHOLD VALUE			○

FIG. 2B

MULTI-POLICY RULE	COMBINATION OF SINGLE POLICY RULES
POLICY RULE 10	POLICY RULE 1+POLICY RULE 2
POLICY RULE 11	POLICY RULE 1+POLICY RULE 3
POLICY RULE 12	POLICY RULE 2+POLICY RULE 3
POLICY RULE 13	POLICY RULE 1+POLICY RULE 2+POLICY RULE 3
POLICY RULE 14	POLICY RULE 4+POLICY RULE 5
POLICY RULE 15	POLICY RULE 4+POLICY RULE 6
POLICY RULE 16	POLICY RULE 5+POLICY RULE 6
POLICY RULE 17	POLICY RULE 4+POLICY RULE 5+POLICY RULE 6
POLICY RULE 18	POLICY RULE 7+POLICY RULE 8
POLICY RULE 19	POLICY RULE 7+POLICY RULE 9
POLICY RULE 20	POLICY RULE 8+POLICY RULE 9
POLICY RULE 21	POLICY RULE 7+POLICY RULE 8+POLICY RULE 9

FIG. 2C

PATH NAME	ALLOCATED POLICY RULE	PRIORITY
TUNNEL-1	POLICY RULE 1	HIGH
	POLICY RULE 2	LOW
TUNNEL-2	POLICY RULE 3	HIGH
	POLICY RULE 1	LOW
⋮	⋮	⋮

FIG. 3

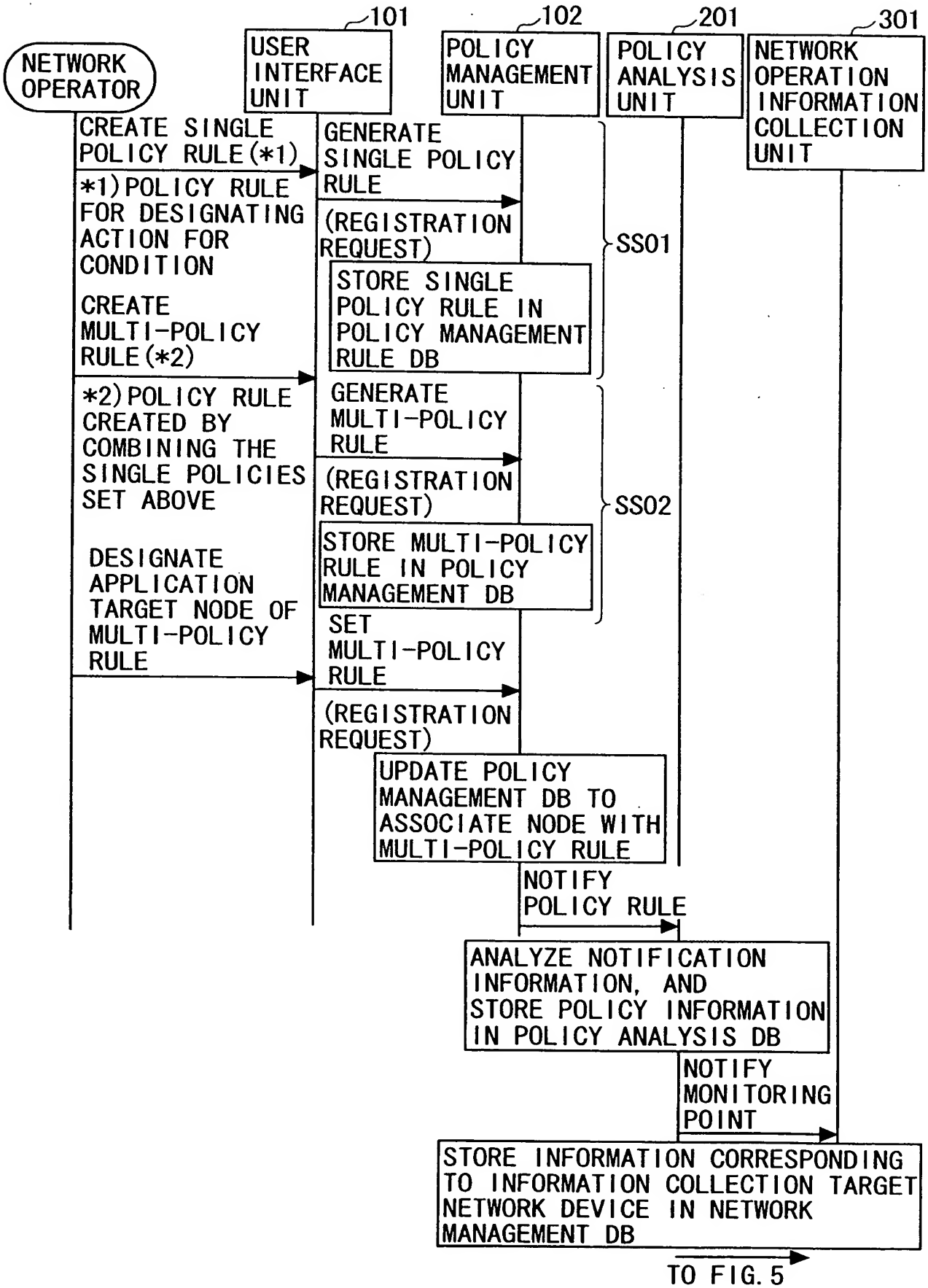
NETWORK OPERATOR
101
USER INTERFACE UNIT
102
POLICY MANAGEMENT UNIT
201
POLICY ANALYSIS UNIT
301
NETWORK OPERATION INFORMATION COLLECTION UNIT
CREATE SINGLE POLICY RULE(*1)
*1)POLICY RULE FOR DESIGNATING ACTION FOR CONDITION
GENERATE SINGLE POLICY RULE
(REGISTRATION REQUEST)
STORE SINGLE POLICY RULE IN POLICY MANAGEMENT RULE DB
SS01
CREATE MULTI-POLICY RULE(*2)
*2)POLICY RULE CREATED BY COMBINING THE SINGLE POLICIES SET ABOVE
GENERATE MULTI-POLICY RULE
(REGISTRATION REQUEST)
STORE MULTI-POLICY RULE IN POLICY MANAGEMENT DB
SS02
DESIGNATE APPLICATION TARGET NODE OF MULTI-POLICY RULE
SET MULTI-POLICY RULE
(REGISTRATION REQUEST)
UPDATE POLICY MANAGEMENT DB TO ASSOCIATE NODE WITH MULTI-POLICY RULE
NOTIFY POLICY RULE
ANALYZE NOTIFICATION INFORMATION, AND STORE POLICY INFORMATION IN POLICY ANALYSIS DB
NOTIFY MONITORING POINT
STORE INFORMATION CORRESPONDING TO INFORMATION COLLECTION TARGET NETWORK DEVICE IN NETWORK MANAGEMENT DB
TO FIG. 5

FIG. 4

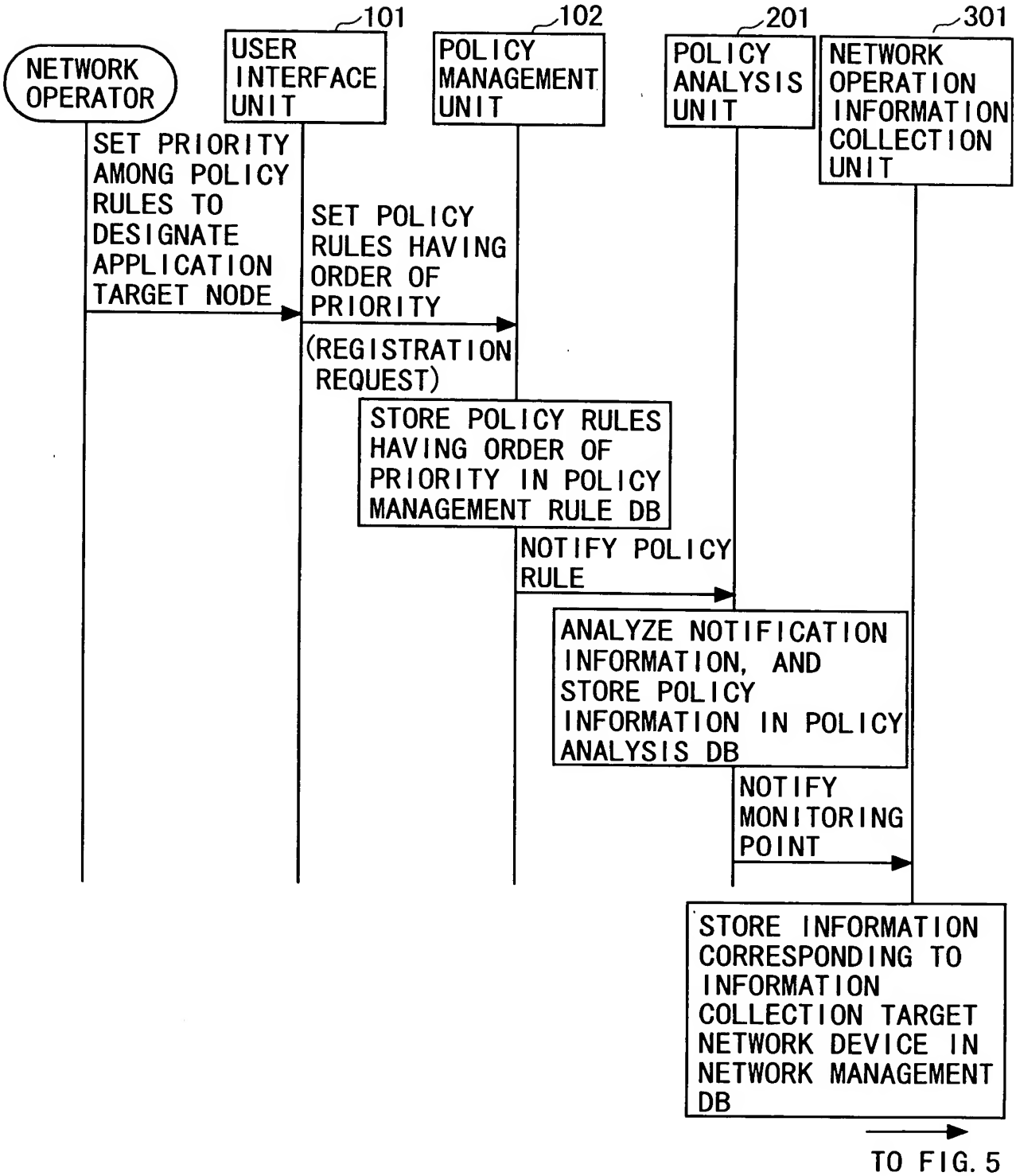
NETWORK OPERATOR
101
USER INTERFACE UNIT
102
POLICY MANAGEMENT UNIT
201
POLICY ANALYSIS UNIT
301
NETWORK OPERATION INFORMATION COLLECTION UNIT
SET PRIORITY AMONG POLICY RULES TO DESIGNATE APPLICATION TARGET NODE
SET POLICY RULES HAVING ORDER OF PRIORITY
(REGISTRATION REQUEST)
STORE POLICY RULES HAVING ORDER OF PRIORITY IN POLICY MANAGEMENT RULE DB
NOTIFY POLICY RULE
ANALYZE NOTIFICATION INFORMATION, AND STORE POLICY INFORMATION IN POLICY ANALYSIS DB
NOTIFY MONITORING POINT
STORE INFORMATION CORRESPONDING TO INFORMATION COLLECTION TARGET NETWORK DEVICE IN NETWORK MANAGEMENT DB
TO FIG. 5

FIG. 5

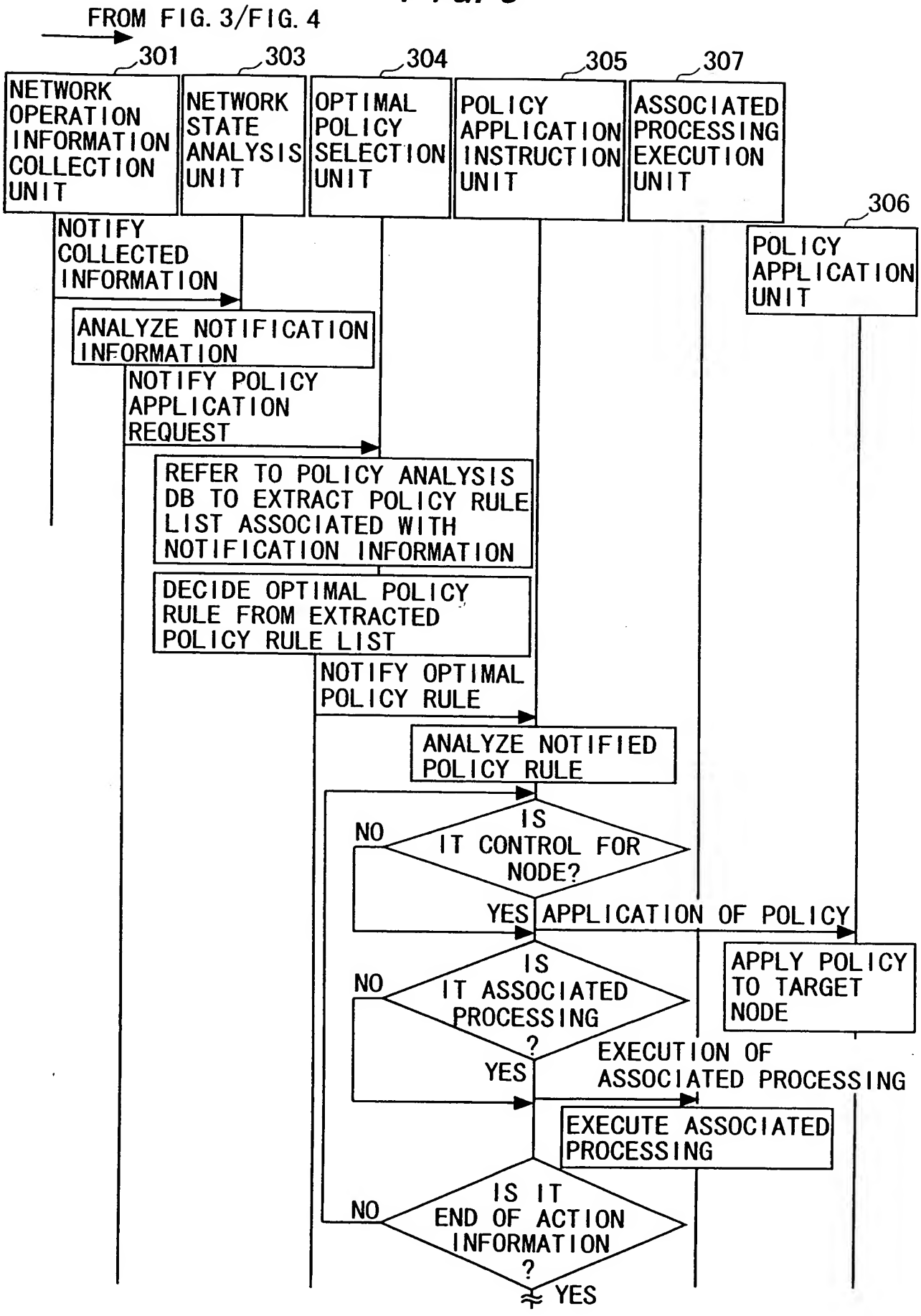
FROM FIG. 3/FIG. 4
301
303
304
305
307
306
NETWORK OPERATION INFORMATION COLLECTION UNIT
NETWORK STATE ANALYSIS UNIT
OPTIMAL POLICY SELECTION UNIT
POLICY APPLICATION INSTRUCTION UNIT
ASSOCIATED PROCESSING EXECUTION UNIT
POLICY APPLICATION UNIT
NOTIFY COLLECTED INFORMATION
ANALYZE NOTIFICATION INFORMATION
NOTIFY POLICY APPLICATION REQUEST
REFER TO POLICY ANALYSIS DB TO EXTRACT POLICY RULE LIST ASSOCIATED WITH NOTIFICATION INFORMATION
DECIDE OPTIMAL POLICY RULE FROM EXTRACTED POLICY RULE LIST
NOTIFY OPTIMAL POLICY RULE
ANALYZE NOTIFIED POLICY RULE
IS IT CONTROL FOR NODE?
NO
YES
APPLICATION OF POLICY
APPLY POLICY TO TARGET NODE
IS IT ASSOCIATED PROCESSING ?
NO
YES
EXECUTION OF ASSOCIATED PROCESSING
EXECUTE ASSOCIATED PROCESSING
IS IT END OF ACTION INFORMATION ?
NO
YES

FIG. 6

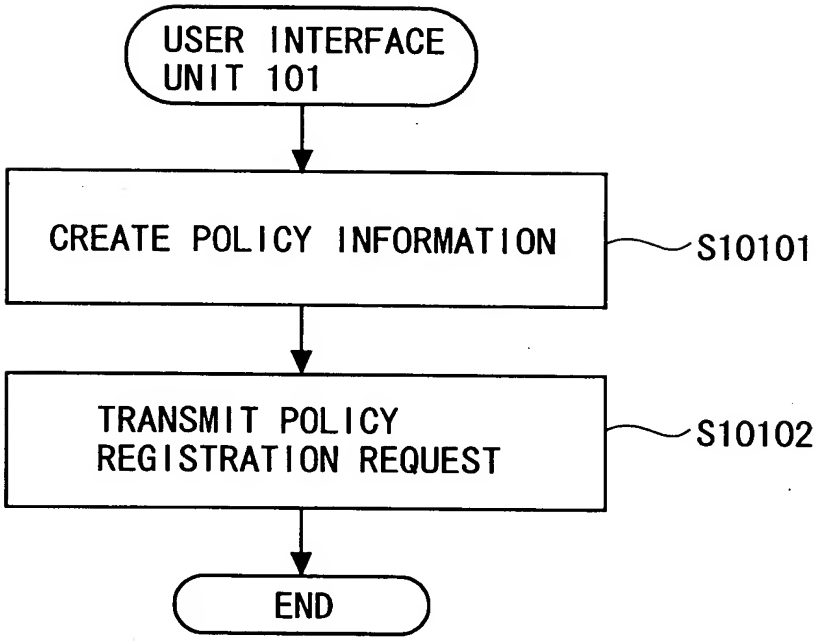
USER INTERFACE UNIT 101
CREATE POLICY INFORMATION
S10101
TRANSMIT POLICY REGISTRATION REQUEST
S10102
END

FIG. 7

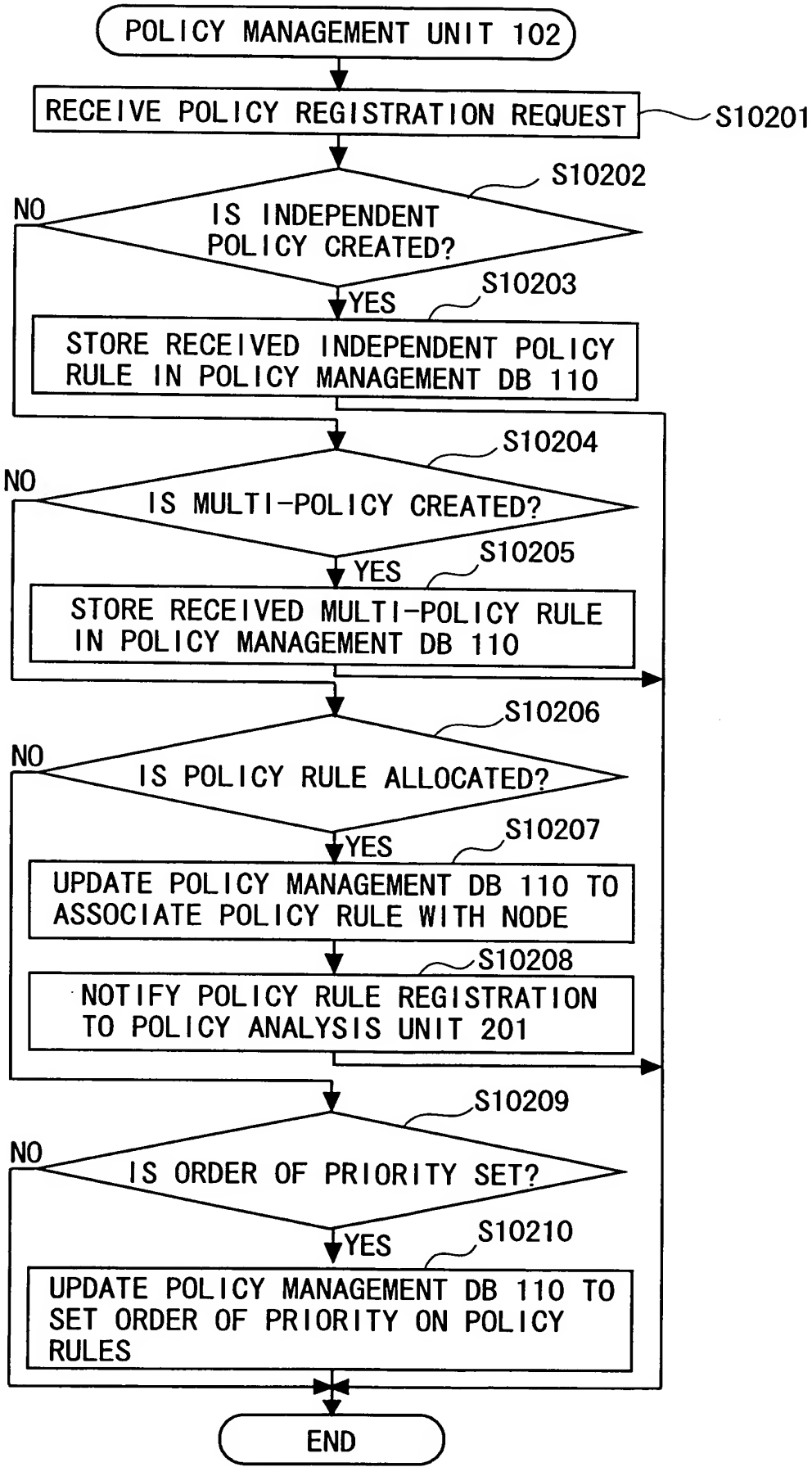
POLICY MANAGEMENT UNIT 102
RECEIVE POLICY REGISTRATION REQUEST
S10201
S10202
IS INDEPENDENT POLICY CREATED?
NO
YES
S10203
STORE RECEIVED INDEPENDENT POLICY RULE IN POLICY MANAGEMENT DB 110
S10204
IS MULTI-POLICY CREATED?
NO
YES
S10205
STORE RECEIVED MULTI-POLICY RULE IN POLICY MANAGEMENT DB 110
S10206
IS POLICY RULE ALLOCATED?
NO
YES
S10207
UPDATE POLICY MANAGEMENT DB 110 TO ASSOCIATE POLICY RULE WITH NODE
S10208
NOTIFY POLICY RULE REGISTRATION TO POLICY ANALYSIS UNIT 201
S10209
IS ORDER OF PRIORITY SET?
NO
YES
S10210
UPDATE POLICY MANAGEMENT DB 110 TO SET ORDER OF PRIORITY ON POLICY RULES
END

FIG. 8

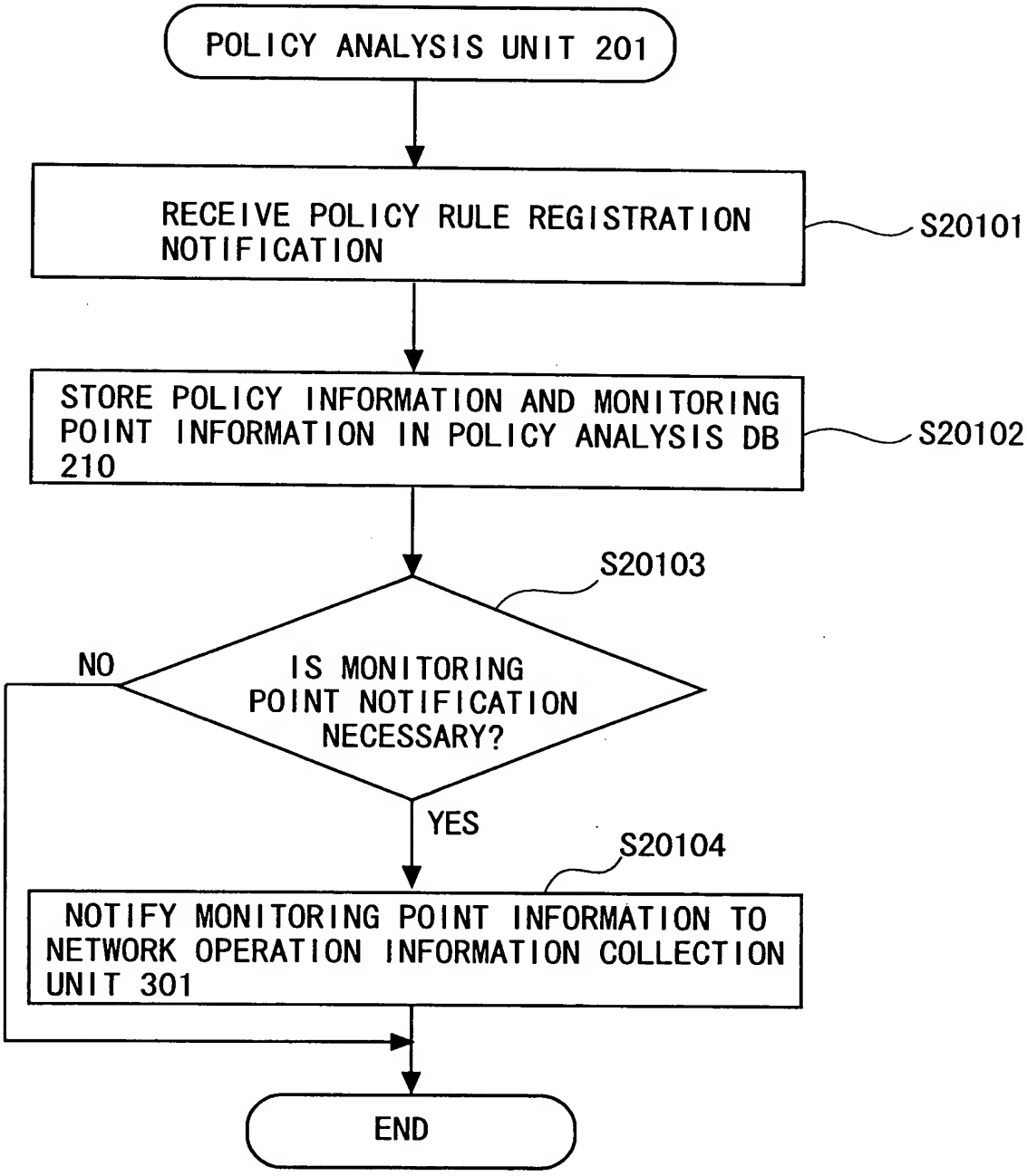
POLICY ANALYSIS UNIT 201
RECEIVE POLICY RULE REGISTRATION NOTIFICATION
S20101
STORE POLICY INFORMATION AND MONITORING POINT INFORMATION IN POLICY ANALYSIS DB 210
S20102
S20103
IS MONITORING POINT NOTIFICATION NECESSARY?
NO
YES
S20104
NOTIFY MONITORING POINT INFORMATION TO NETWORK OPERATION INFORMATION COLLECTION UNIT 301
END

FIG. 9

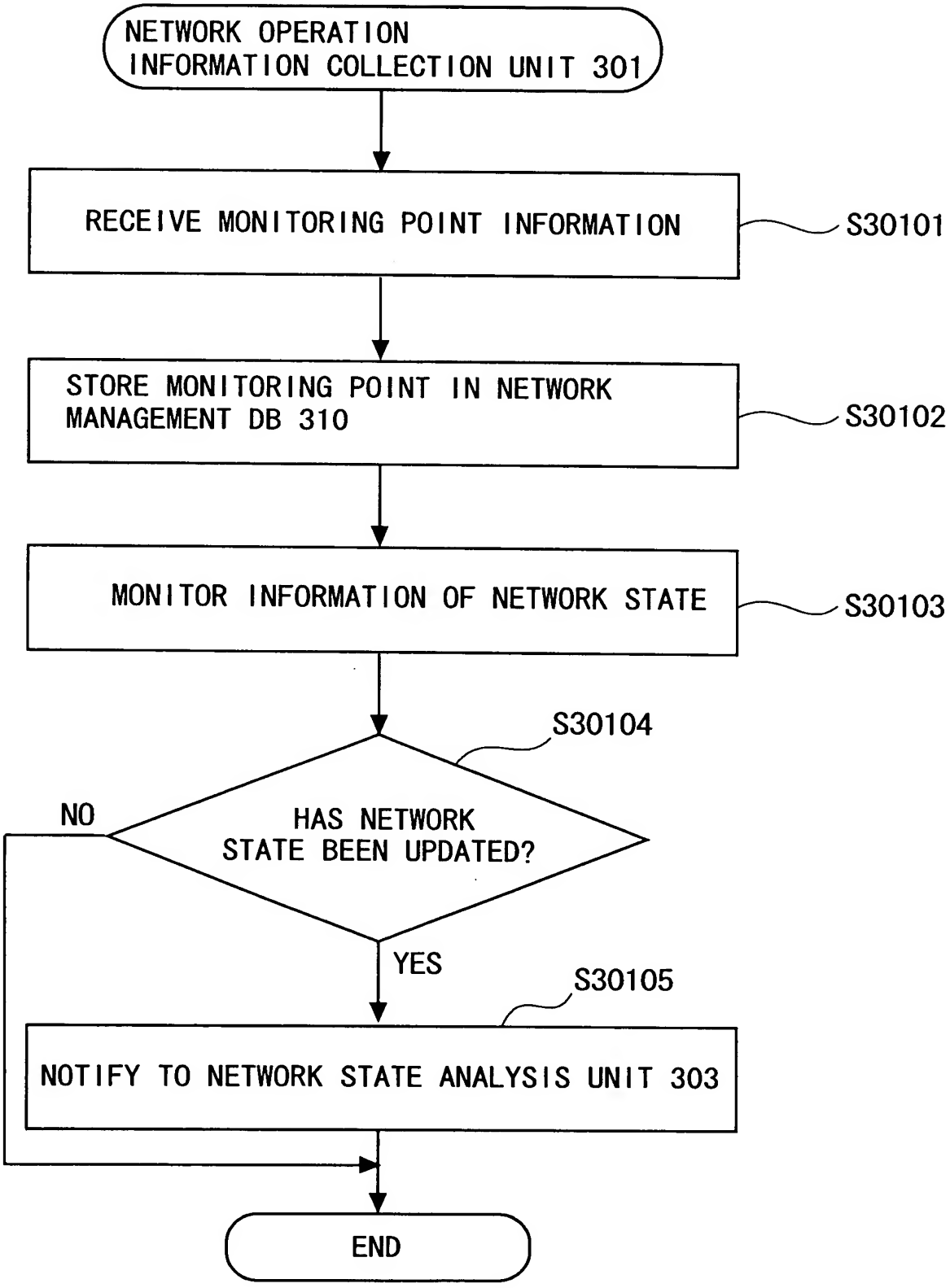
NETWORK OPERATION INFORMATION COLLECTION UNIT 301
RECEIVE MONITORING POINT INFORMATION
S30101
STORE MONITORING POINT IN NETWORK MANAGEMENT DB 310
S30102
MONITOR INFORMATION OF NETWORK STATE
S30103
S30104
HAS NETWORK STATE BEEN UPDATED?
NO
YES
S30105
NOTIFY TO NETWORK STATE ANALYSIS UNIT 303
END

FIG. 10

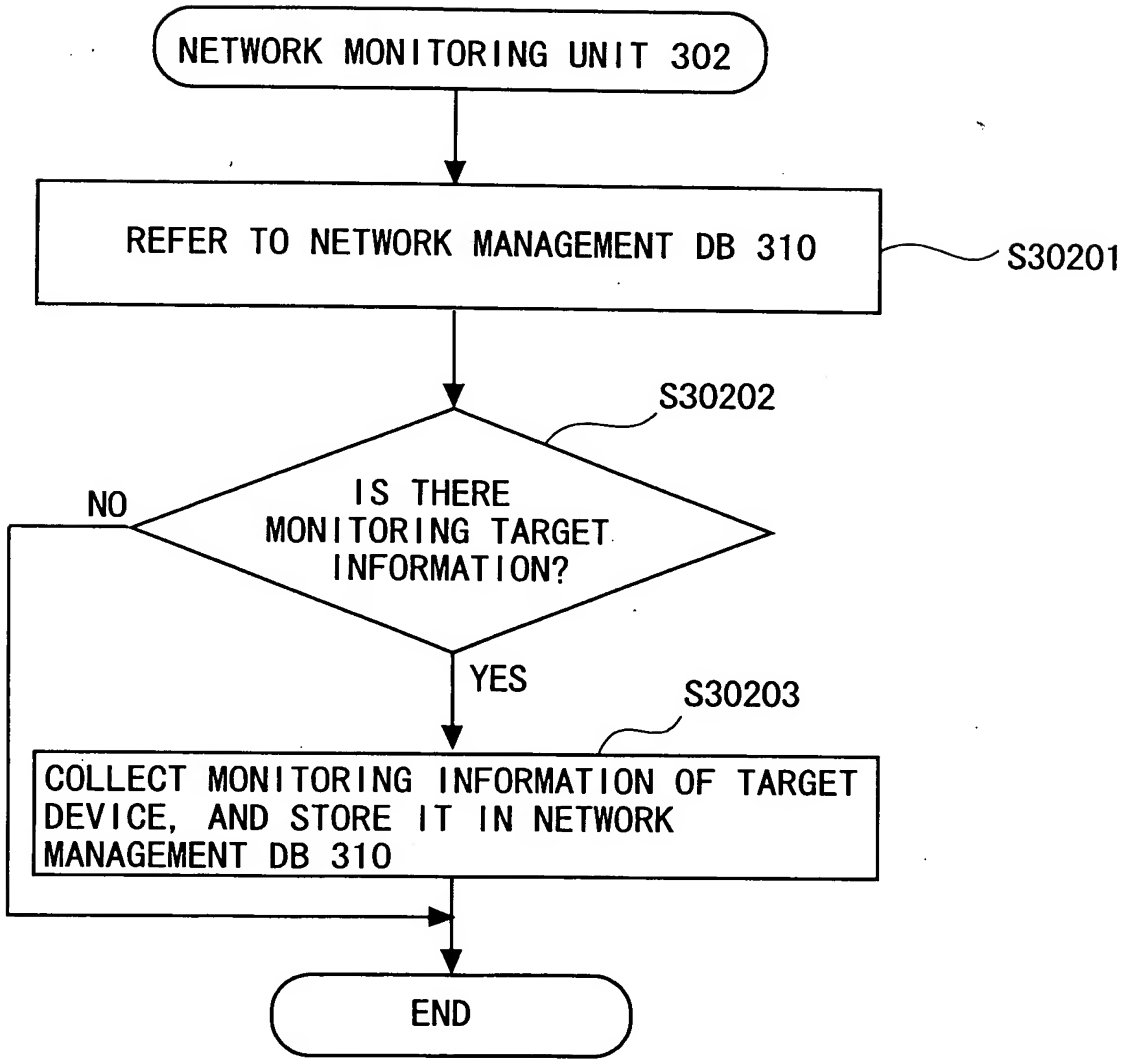
NETWORK MONITORING UNIT 302
REFER TO NETWORK MANAGEMENT DB 310
S30201
S30202
IS THERE MONITORING TARGET INFORMATION?
NO
YES
S30203
COLLECT MONITORING INFORMATION OF TARGET DEVICE, AND STORE IT IN NETWORK MANAGEMENT DB 310
END

FIG. 11

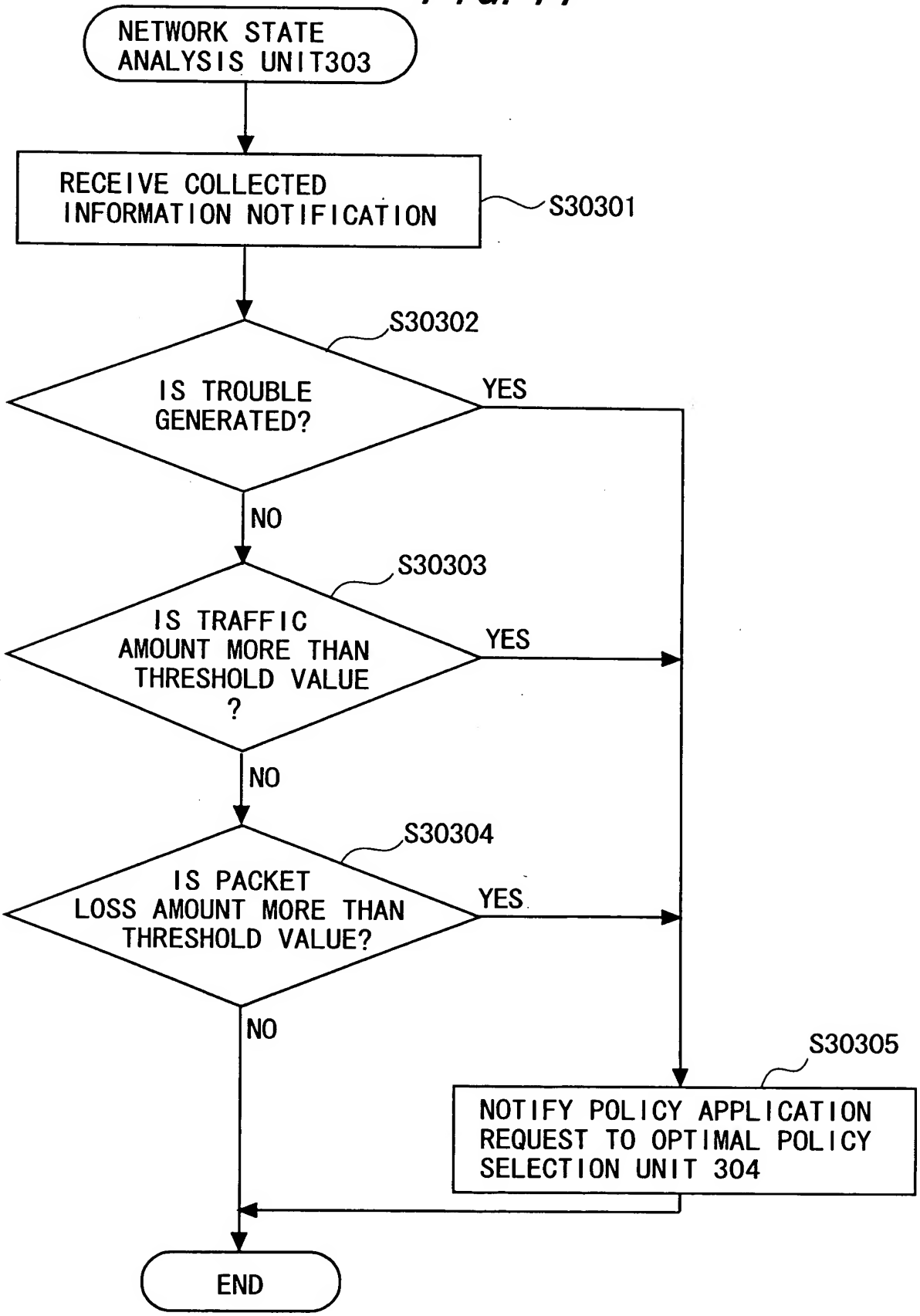
NETWORK STATE ANALYSIS UNIT303
RECEIVE COLLECTED INFORMATION NOTIFICATION
S30301
S30302
IS TROUBLE GENERATED?
YES
NO
S30303
IS TRAFFIC AMOUNT MORE THAN THRESHOLD VALUE ?
YES
NO
S30304
IS PACKET LOSS AMOUNT MORE THAN THRESHOLD VALUE?
YES
NO
S30305
NOTIFY POLICY APPLICATION REQUEST TO OPTIMAL POLICY SELECTION UNIT 304
END

FIG. 12

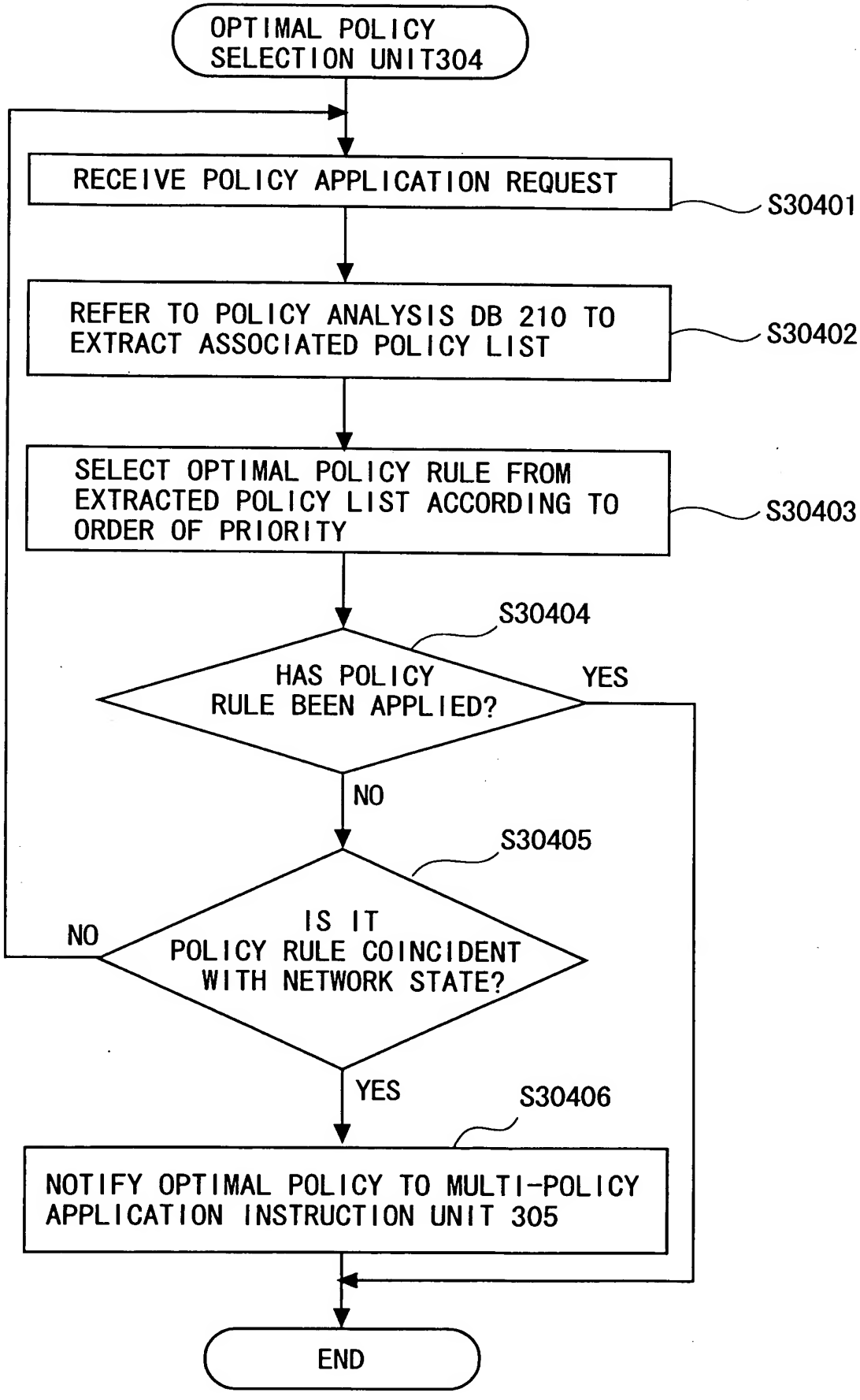
OPTIMAL POLICY SELECTION UNIT304
RECEIVE POLICY APPLICATION REQUEST
S30401
REFER TO POLICY ANALYSIS DB 210 TO EXTRACT ASSOCIATED POLICY LIST
S30402
SELECT OPTIMAL POLICY RULE FROM EXTRACTED POLICY LIST ACCORDING TO ORDER OF PRIORITY
S30403
S30404
HAS POLICY RULE BEEN APPLIED?
YES
NO
S30405
IS IT POLICY RULE COINCIDENT WITH NETWORK STATE?
NO
YES
S30406
NOTIFY OPTIMAL POLICY TO MULTI-POLICY APPLICATION INSTRUCTION UNIT 305
END

FIG. 13

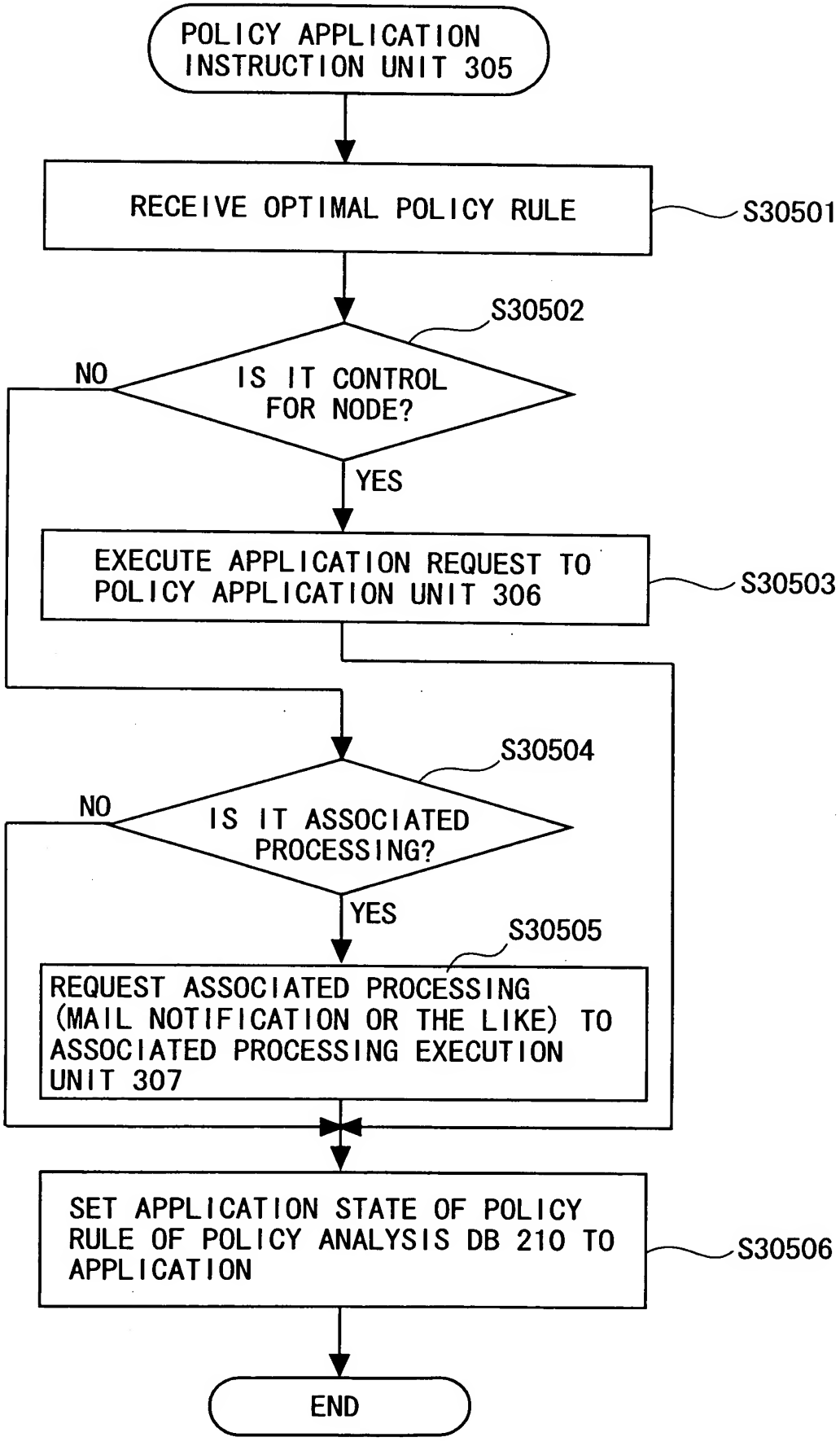
POLICY APPLICATION INSTRUCTION UNIT 305
RECEIVE OPTIMAL POLICY RULE
S30501
S30502
IS IT CONTROL FOR NODE?
NO
YES
EXECUTE APPLICATION REQUEST TO POLICY APPLICATION UNIT 306
S30503
S30504
IS IT ASSOCIATED PROCESSING?
NO
YES
S30505
REQUEST ASSOCIATED PROCESSING (MAIL NOTIFICATION OR THE LIKE) TO ASSOCIATED PROCESSING EXECUTION UNIT 307
SET APPLICATION STATE OF POLICY RULE OF POLICY ANALYSIS DB 210 TO APPLICATION
S30506
END

FIG. 14

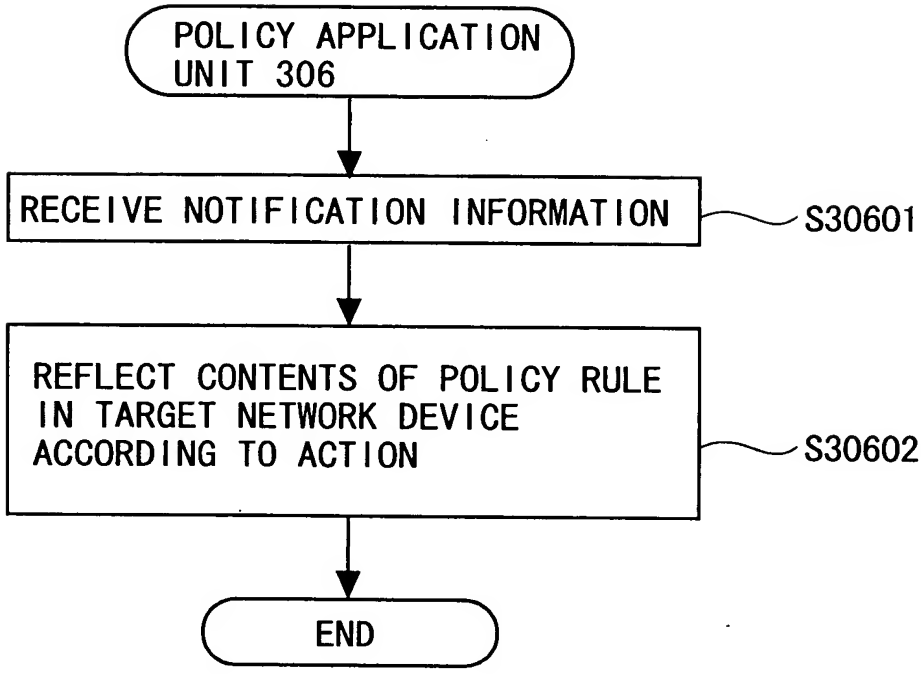
POLICY APPLICATION UNIT 306
RECEIVE NOTIFICATION INFORMATION
S30601
REFLECT CONTENTS OF POLICY RULE IN TARGET NETWORK DEVICE ACCORDING TO ACTION
S30602
END

FIG. 15

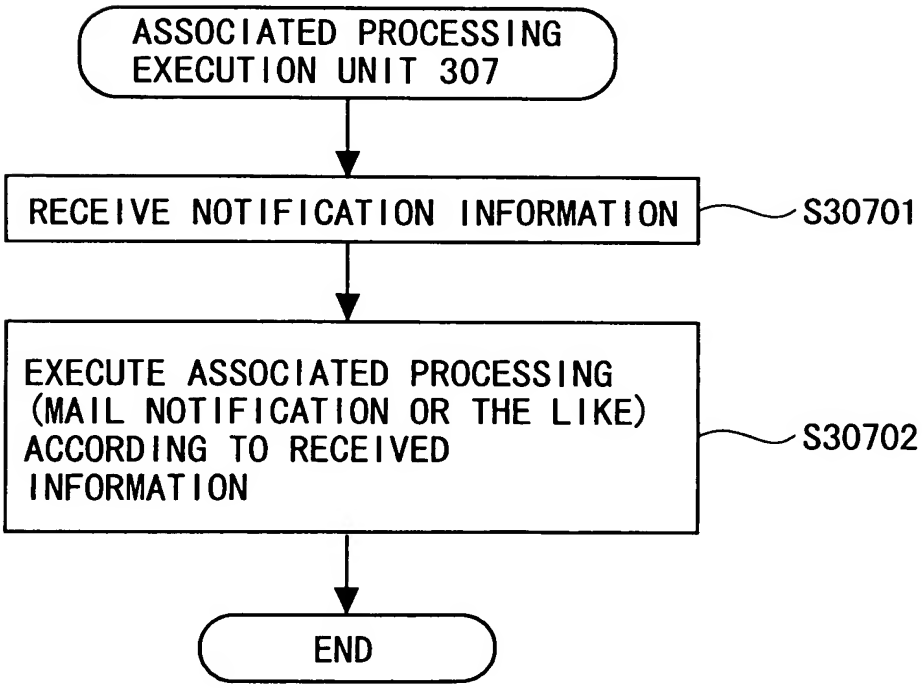
ASSOCIATED PROCESSING EXECUTION UNIT 307
RECEIVE NOTIFICATION INFORMATION
S30701
EXECUTE ASSOCIATED PROCESSING (MAIL NOTIFICATION OR THE LIKE) ACCORDING TO RECEIVED INFORMATION
S30702
END

FIG. 16

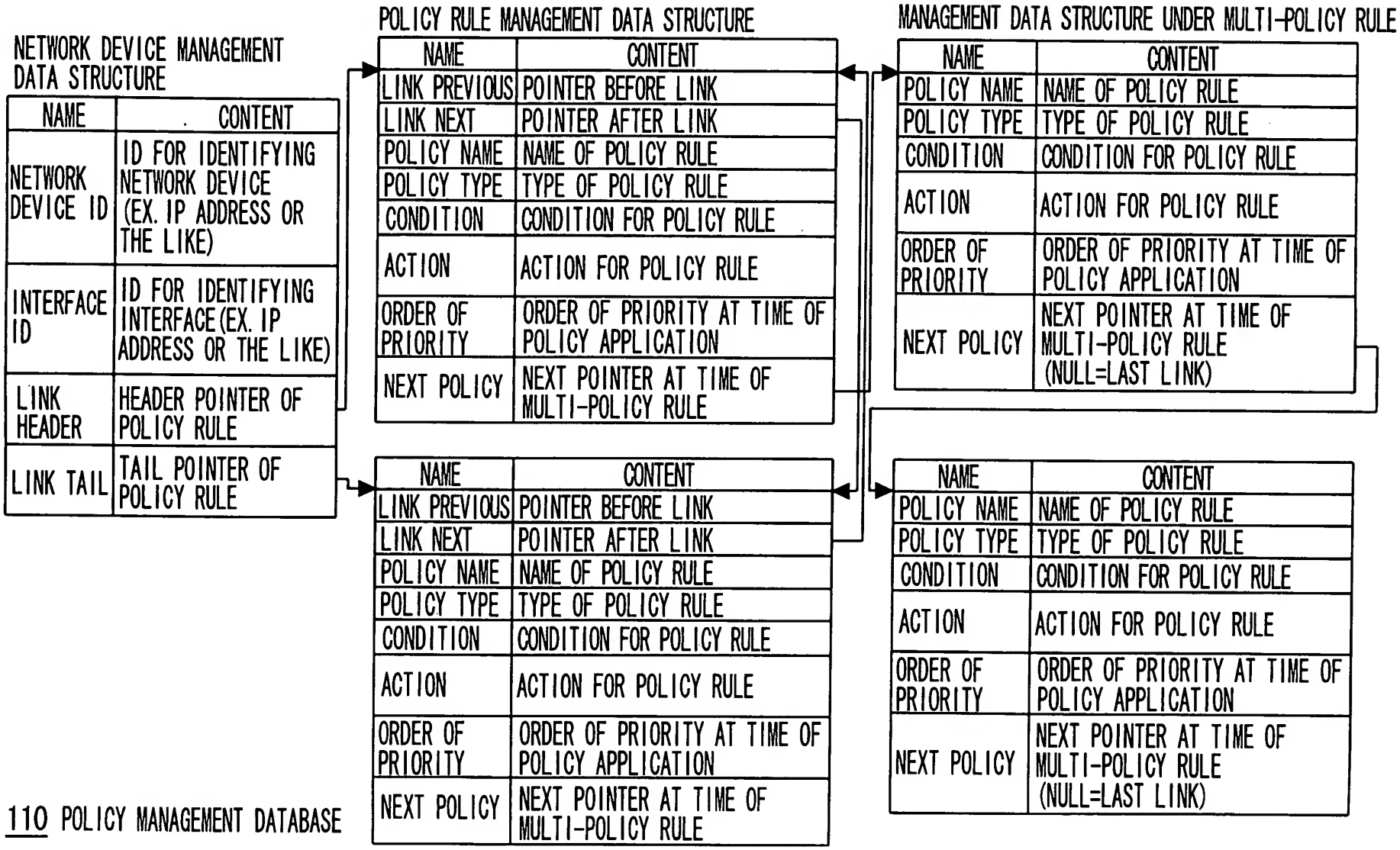
NETWORK DEVICE MANAGEMENT DATA STRUCTURE
NAME
CONTENT
NETWORK DEVICE ID
ID FOR IDENTIFYING NETWORK DEVICE (EX. IP ADDRESS OR THE LIKE)
INTERFACE ID
ID FOR IDENTIFYING INTERFACE (EX. IP ADDRESS OR THE LIKE)
LINK HEADER
HEADER POINTER OF POLICY RULE
LINK TAIL
TAIL POINTER OF POLICY RULE
POLICY RULE MANAGEMENT DATA STRUCTURE
NAME
CONTENT
LINK PREVIOUS
POINTER BEFORE LINK
LINK NEXT
POINTER AFTER LINK
POLICY NAME
NAME OF POLICY RULE
POLICY TYPE
TYPE OF POLICY RULE
CONDITION
CONDITION FOR POLICY RULE
ACTION
ACTION FOR POLICY RULE
ORDER OF PRIORITY
ORDER OF PRIORITY AT TIME OF POLICY APPLICATION
NEXT POLICY
NEXT POINTER AT TIME OF MULTI-POLICY RULE
MANAGEMENT DATA STRUCTURE UNDER MULTI-POLICY RULE
NAME
CONTENT
POLICY NAME
NAME OF POLICY RULE
POLICY TYPE
TYPE OF POLICY RULE
CONDITION
CONDITION FOR POLICY RULE
ACTION
ACTION FOR POLICY RULE
ORDER OF PRIORITY
ORDER OF PRIORITY AT TIME OF POLICY APPLICATION
NEXT POLICY
NEXT POINTER AT TIME OF MULTI-POLICY RULE (NULL=LAST LINK)
NAME
CONTENT
LINK PREVIOUS
POINTER BEFORE LINK
LINK NEXT
POINTER AFTER LINK
POLICY NAME
NAME OF POLICY RULE
POLICY TYPE
TYPE OF POLICY RULE
CONDITION
CONDITION FOR POLICY RULE
ACTION
ACTION FOR POLICY RULE
ORDER OF PRIORITY
ORDER OF PRIORITY AT TIME OF POLICY APPLICATION
NEXT POLICY
NEXT POINTER AT TIME OF MULTI-POLICY RULE
NAME
CONTENT
POLICY NAME
NAME OF POLICY RULE
POLICY TYPE
TYPE OF POLICY RULE
CONDITION
CONDITION FOR POLICY RULE
ACTION
ACTION FOR POLICY RULE
ORDER OF PRIORITY
ORDER OF PRIORITY AT TIME OF POLICY APPLICATION
NEXT POLICY
NEXT POINTER AT TIME OF MULTI-POLICY RULE (NULL=LAST LINK)
110 POLICY MANAGEMENT DATABASE

FIG. 17

NETWORK DEVICE MANAGEMENT DATA STRUCTURE

NAME	CONTENT
NETWORK DEVICE ID	ID FOR IDENTIFYING NETWORK DEVICE (EX. IP ADDRESS OR THE LIKE)
INTERFACE ID	ID FOR IDENTIFYING INTERFACE (EX. IP ADDRESS OR THE LIKE)
APPLIED POLICY RULE NUMBER	NUMBER OF APPLIED POLICY RULES
LINK HEADER	HEADER POINTER OF POLICY RULE
LINK TAIL	TAIL POINTER OF POLICY RULE

POLICY RULE MANAGEMENT DATA STRUCTURE

NAME	CONTENT
LINK PREVIOUS	POINTER BEFORE LINK
LINK NEXT	POINTER AFTER LINK
POLICY NAME	NAME OF POLICY RULE
POLICY TYPE	TYPE OF POLICY RULE
CONDITION	CONDITION FOR POLICY RULE
ACTION	ACTION FOR POLICY RULE
ORDER OF PRIORITY	ORDER OF PRIORITY AT TIME OF POLICY APPLICATION
APPLICATION STATE	APPLIED STATE OF POLICY RULE
NEXT POLICY	NEXT POINTER AT TIME OF MULTI-POLICY RULE

NAME	CONTENT
LINK PREVIOUS	POINTER BEFORE LINK
LINK NEXT	POINTER AFTER LINK
POLICY NAME	NAME OF POLICY RULE
POLICY TYPE	TYPE OF POLICY RULE
CONDITION	CONDITION FOR POLICY RULE
ACTION	ACTION FOR POLICY RULE
ORDER OF PRIORITY	ORDER OF PRIORITY AT TIME OF POLICY APPLICATION
APPLICATION STATE	APPLIED STATE OF POLICY RULE
NEXT POLICY	NEXT POINTER AT TIME OF MULTI-POLICY RULE

MANAGEMENT DATA STRUCTURE UNDER MULTI-POLICY RULE

NAME	CONTENT
POLICY NAME	NAME OF POLICY RULE
POLICY TYPE	TYPE OF POLICY RULE
CONDITION	CONDITION FOR POLICY RULE
ACTION	ACTION FOR POLICY RULE
ORDER OF PRIORITY	ORDER OF PRIORITY AT TIME OF POLICY APPLICATION
APPLICATION STATE	APPLIED STATE OF POLICY RULE
NEXT POLICY	NEXT POINTER AT TIME OF MULTI-POLICY RULE (NULL=LAST LINK)

NAME	CONTENT
POLICY NAME	NAME OF POLICY RULE
POLICY TYPE	TYPE OF POLICY RULE
CONDITION	CONDITION FOR POLICY RULE
ACTION	ACTION FOR POLICY RULE
ORDER OF PRIORITY	ORDER OF PRIORITY AT TIME OF POLICY APPLICATION
APPLICATION STATE	APPLIED STATE OF POLICY RULE
NEXT POLICY	NEXT POINTER AT TIME OF MULTI-POLICY RULE (NULL=LAST LINK)

210 POLICY ANALYSIS DATABASE

FIG. 18

NETWORK DEVICE MANAGEMENT DATA STRUCTURE

NAME	CONTENT
NETWORK DEVICE ID	ID FOR IDENTIFYING NETWORK DEVICE (EX. IP ADDRESS OR THE LIKE)
INTERFACE ID	ID FOR IDENTIFYING INTERFACE (EX. IP ADDRESS OR THE LIKE)
PORT STATE	STATE OF PORT (TROUBLE OR THE LIKE)
TRAFFIC AMOUNT	TRAFFIC AMOUNT OF INTERFACE
PACKET LOSS AMOUNT	PACKET LOSS AMOUNT OF INTERFACE

310 NETWORK MANAGEMENT DATABASE